present day, group theory, as applied to the solid state, is no longer a developing subject. It is rather a well defined and well understood tool that has become a useful "part of the physicist's luggage."

The foundations of applied group theory, the so-called abstract mathematical theory of groups and their representations, can be presented in a closed form consisting of an almost endless succession of definitions, propositions, lemmas and theorems. This, in one of its most detailed versions I have seen recently anywhere, takes T. Janssen (The Catholic University, Nijmegen, The Netherlands) through 69 very dense pages of *Crystallographic Groups;* these pages are full of complicated notations and rigorous proofs.

The definition and study of those groups of interest to the solid-state physicist, the crystallographic point groups, the space groups and spin- and time-reversal symmetry require 107 pages more, this time slightly less algebraic but much more geometrical. Physical applications to electron bands, lattice vibrations, electron dynamics and magnetic groups take only 56 pages.

The book is rather short and *very* dense. The notation is very mathematical and the style "stiff" and rigorous. No appeal is made to intuitive ideas; everything is either defined, derived or proved. But it also is a complete book in its field: no loose ends are left hanging, no theorem is left unproven.

The small type and crowded printing contribute in no small way to the impression of heaviness given by this book. It is not easy reading, but for those interested in the subject matter, it is nice to know that the information is all there; it is possible to have all you ever wanted to know about crystallographic groups on your bookshelves with this single volume.

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Theory of the Earth's Gravity Field

M. Pick, J. Pícha, V. Vyskočil
538 pp. Elsevier, New York 1973. $34.00

The study of the Earth's gravitational field has always been an area of investigation of interest to geodesists and geophysicists. In the past fifteen years such interests have intensified because of needs in such areas as the precise determination of positions on the surface of the Earth, the accurate computation of missile and satellite trajectories and the potential for gaining insight into Earth studies from an analysis of global and local variations of the gravity field. The publication of this book follows the publication of books in the same or allied areas by M. Caputo (1967), W. Heiskanen and H. Moritz (1967), P. Melchior (1971), J. Levallois (1970) and others. *Theory of the Earth's Gravity Field* consists of a series of chapters individually written and identified as such by one of three authors, each of whom is an active worker in the field of gravimetric (or physical) geodesy. They completed the material for the book in 1970 with this translation from the Czechoslovakian appearing in 1973.

The material discussed in the book includes the fundamentals of potential theory, classical and modern gravimetric geodesy and geometric geodesy related to coordinate systems as written by M. Pick. J. Pícha has written the sections concerned with gravity measurements, earth tides and time variations of the gravity field. A discussion of the statistical behavior of gravity anomalies, and the geophysical interpretation of gravity anomalies was prepared by V. Vyskočil. Within each chapter certain sections are marked as ones to skip, if desired, on the first reading. There are a total of 1693 numbered equations and a list of 462 references, 100 of which are references to Russian articles. A mathematical appendix (by Pick) derives or discusses various potential-theory problems including spherical harmonics and includes a valuable section on the sums of certain series involving Legendre polynomials.

The material discussed in the book is generally well handled relative to the space used for it. This is especially true of the theoretical parts of the book. One aspect that seems to be lacking in some areas is a numerical estimate of some of the quantities being discussed. For example, I would have liked to have seen discussion of the magnitudes of various types of anomalies and correction terms, such as the gravity topographic correction.

In the discussion of absolute gravity measurements, additional information could have been given with respect to some of the precise measurements made by Faller, and by Sakuma using free-fall types of experiments. Such important work has not been referenced in the book.

One of the larger areas not discussed in this book lies in the field of the determination of the external gravitational field of the earth. In the past few years considerable progress has been made through the determination of gravitational potential coefficients by the analysis of satellite orbits. These methods brought, for the first time, accurate information on the lowdegree behavior of the Earth's gravity field. Such methods and results are not discussed in this book. In addition the authors do not present methods for the computation of the gravitational vector in space from terrestrial gravity material (or satellite data).

Finally, it could be noted that the statistical analysis of gravity material has received considerable attention in the literature in the past few years. However, only five pages of discussion are related to this subject in a notation that could have been much improved by the use of matrices.

This book would be valuable as a text in a course in theoretical problems in gravimetric geodesy. It is written in such a way that, by the proper selection of material, either an elementary or an advanced-level course could be given. In addition the book will be a welcome addition to the library of a researcher involved with the determination of the Earth's gravity field from terrestrial measurements.

To summarize, I liked this book from its theoretical point of view. I found many useful equations that I had not seen before. Numerical information and considerations related to the external gravitational field, however, will have to be found elsewhere.

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The Titius–Bode Law of Planetary Distances: Its History and Theory

M. M. Nieto
161 pp. Pergamon, New York 1972.
$11.00

Virtually every student taking a course in elementary astronomy is accosted with "Bode's Law" which, in its most usual form, is presented as the successive terms in the series

$$r_n = (4 + 3 \times 2^n)/10$$

where $n = -\infty, 0, 1, 2, \ldots$ These terms very nearly agree with the semimajor axes (mean distances) of each successive planet from the Sun, taking the Earth's mean distance as the unit of distance (one astronomical unit or AU). It is then recounted that Johann Bode, a German astronomer, observed (as did a number of his predecessors including Kepler) that at $r_n = 2.8$ AU, between the orbits of Mars and Jupiter, there existed no planet. After an international observing campaign organized by Bode, the first of a large number of minor planets or asteroids, Ceres, was discovered on the first day of the nineteenth century. Most textbooks will also point out that this law was first published by Titius.